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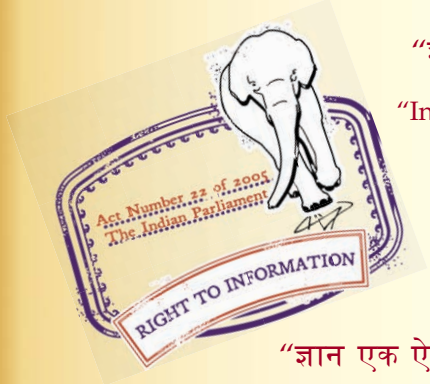

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IS 6180 : 1989
(Reaffirmed 2004)

Indian Standard

TOUGHENED SAFETY GLASSES FOR SHIPS' ROUND WINDOWS — SPECIFICATION

(First Revision)

भारतीय मानक

जहाजों की गोल खिड़कियों के लिए आदृढ़ीकृत सुरक्षित शीशे — विशिष्टि

(पहला पुनरीक्षण)

UDC 629·12·011·83 : 666·155·5 : 666·181

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 1990

Price Group 3

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 19 July 1989, after the draft finalized by the Shipbuilding Sectional Committee had been approved by the Transport Engineering Divison Council.

This standard was first published in 1971. This revision has been necessitated to incorporate the following changes:

a) Sheet glass has been deleted,

b) Tolerances for parallelism have been deleted,

c) Maximum allowable pressure head (in kPa) has been included, and

d) 4 mm thickness has been deleted and 19 mm thickness has been added.

Toughened safety glass (float or polished) is produced by subjecting glass to a process of heating and rapid cooling so as to induce high compressive stresses in the surface zones balanced by high tension in the central plane. This treatment endows the glass with greatly increased resistance to external forces, such as mechanical loading and thermal shock. If toughened safety glass is fractured it gives fragments which are less liable to cause severe cuts than fragments of ordinary glass.

The process of obscuring transparent glasses shall be effected before the procedure of toughening.

The punch method of load testing has been preferred over the water pressure test since the latter is cumbersome and more time-consuming.

In the preparation of this standard, assistance has been derived from the following:

ISO 614-1976 Testing of toughened glasses for ships' side scuttles and fixed lights by the punch method. International Organization for Standardization (ISO).

ISO 1095-1976 Toughened glasses for ships' side scuttles. International Organization for Standardization (ISO).

The current work on the revision of the above standard has also been taken into consideration.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value; observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TOUGHENED SAFETY GLASSES FOR SHIPS' ROUND WINDOWS — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies the dimensions for interchangeability, tolerances and testing of toughened safety glass (plate glass only) for ships' round windows and fixed lights.

2 REFERENCES

The following Indian Standard is a necessary adjunct to this standard:

IS 11914 : 1986 Glossary of terms for ships' windows

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 11914 : 1986 shall apply.

4 DIMENSIONS

4.1 The diameters of the toughened safety glasses together with thickness, used with light, medium and heavy type ships' round windows, shall be as given in Table 1. They apply to clear glasses and to glasses with an obscured surface on one side.

5 TOLERANCES

5.1 The tolerances on the thickness of toughened plate glass shall be as given in Table 2.

6 FLATNESS

6.1 The admissible flatness (dimension *g*), measured in vertical plane, shall not exceed the values given in Table 3.

7 EDGES

7.1 All edges shall be arrissed and finished to remove sharpness and roughness. Edges of glasses of nominal thickness over 12 mm shall be either ground flat and arrissed or finished by some other such process, provided the finished diameter conforms to the dimensional tolerances specified in Table 1.

7.2 The width '*s*' and depth '*y*' of the arris shall not exceed the dimensions given in Table 4.

7.3 Arrissing and/or grinding shall be carried out prior to the toughening operation.

8 MAXIMUM ALLOWABLE PRESSURE

8.1 The maximum allowable pressure, *P* to which clear toughened safety glasses glazed in round windows can be subjected are given in Table 5.

9 TESTING

9.1 Examination in Polarized Light

Each glass shall be illuminated by plane polarized light falling approximately normally on one face and examined from the opposite side through the analyzing device. To ensure that the glass is properly toughened, the whole area of each glass shall be examined. A suitable apparatus is described in Fig. 1.

White light from two fluorescent tubes passes through a sheet of diffusing glass and a sheet of transparent polarizing material, both of which extend the full width of the glass to be examined.

The glass is supported on rollers and passes in front of the polarizing sheet so that the whole of the glass is viewed in succession through a second polarizing device, for example, spectacles with polarizing material correctly oriented to obtain a polarization pattern. A sheet of plate glass is placed between the polarization sheet and the glass being examined to protect the former from damage.

Other types of polariscope may be used, provided that they permit observation of the polarization pattern over the whole area of each glass.

During this examination, the glasses shall be sorted into batches of similar strain pattern for subjection to the proof load test, if required, as specified in Annex A.

9.2 Proof Load Test

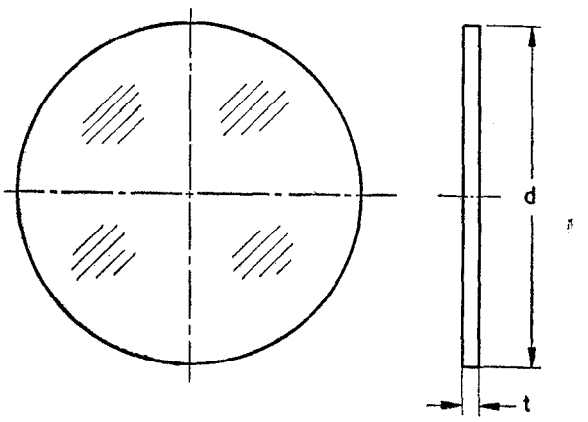
Toughened safety glasses for fitting on board ships shall be subjected to the proof load test as described in Annex A.

9.2.1 Sampling of Glasses

Each batch of glasses shall be subjected to proof load test separately. Where a batch consists of 4 glasses or less, each of the glasses shall be tested. Where a batch consists of more than 4 glasses the test shall be carried out on a random sample of 4 glasses, or on 2 percent of the batch, whichever figure is greater.

Table 1 Dimensions for Toughened Safety Glasses Used with Round Windows
(*Clauses* 4.1 *and* 7.1)

All dimensions in millimetres.



Nominal Size of Round Windows*	Diameter of Glass *d*		Glass Thickness *t*					
	Min	*Max*	6	8	10	12	15	19
200	213	215	×	×	×	(×)	(×)	—
250	263	265	×	×	(×)	×	—	(×)
300	316	319	—	×	×	(×)	×	—
350	366	369	—	×	—	×	×	(×)
400	416	419	—	—	×	×	(×)	×
450	466	469	—	—	×	—	×	—

*Clear light size.

× For clear glasses and obscured glasses.

(×) For frosted obscured or translucent glasses only.

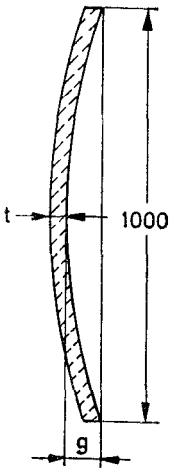
Table 2 Tolerance on Glass Thickness
(*Clause* 5.1)

All dimensions in millimetres.

Glass Thickness, *t*	Tolerance (Plate Glass)
6	± 0·2
8	± 0.3
10	± 0·3
12	± 0·3
15	± 0·5
19	± 1·0

Table 3 Dimensions for Admissible Flatness
(*Clause* 6.1)

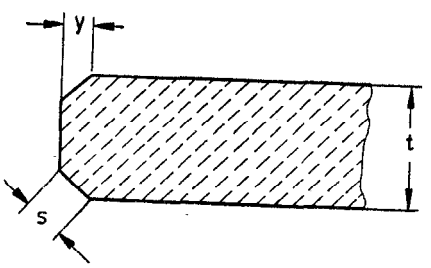
All dimensions in millimetres.



Glass Thickness *t*	*g*
6	3
8	2
10	2
12	2
15	2
19	2

Table 4 Arrissing Dimensions
(*Clause* 7.2)

All dimensions in millimetres.



t	*s*, *Max*	*y*, *Max*
6	2·0	1·5
8	2·0	1·5
10	2·0	1·5
12	2·5	1·8
15	2·5	1·8
19	2·5	1·8

Table 5 Maximum Allowable Pressure
(*Clause* 8.1)

Nominal Size mm	Maximum Allowable Pressure, P in kPa for Glass Thickness, t, mm					
D	6	8	10	12	15	19
200	118	210	328	—	—	—
250	75	134	—	302	—	—
300	—	93	146	—	328	—
350	—	68	—	154	241	—
400	—	—	82	118	—	297
450	—	—	65	—	146[3]	—

NOTES

1 The maximum allowable pressure P is expressed in kPa (1 kPa = 0·1 mH_2O).

2 The values of P to be taken into consideration are those given in the regulations of the Classification Societies for the parts of the ship in which the round windows are to be fitted.

3 $P = 131\,300\,t/D^2$.

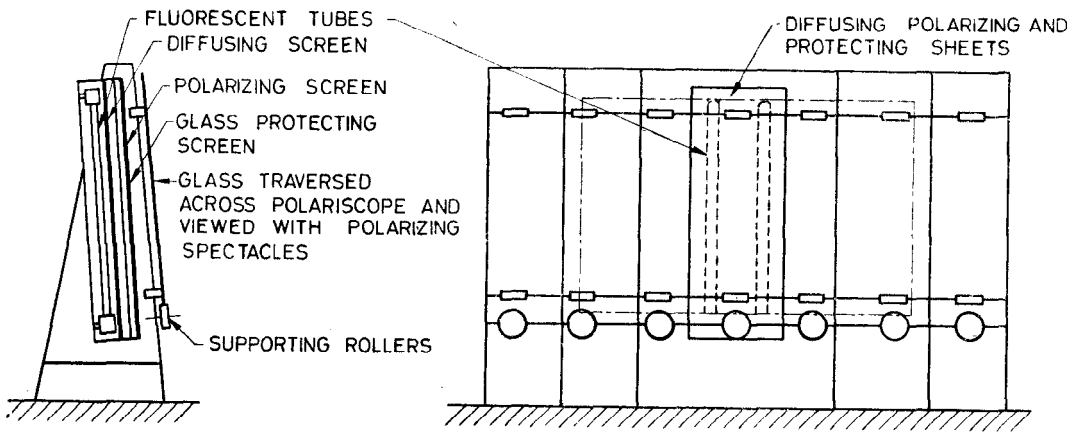


FIG. 1 POLARISCOPE FOR EXAMINING FOR STANDARD OF TOUGHENING

9.2.2 Acceptance Conditions

a) If each sample glass tested remains unbroken, the whole batch shall be accepted.

b) If one sample glass breaks during the test, a complete retest shall be carried out on a further sample taken from the same batch.

c) If more than one glass breaks in the first test, or one glass breaks during the retest, the batch shall be rejected.

9.2.3 If the method of production of glass is such that polarization patterns do not occur, the sampling of glass for strength test, shall be as agreed to between the purchaser and the supplier.

10 DESIGNATION

10.1 Toughened safety glasses for ships' round windows shall be designated by the nominal size of round windows, thickness and type of finish (clear or obscured).

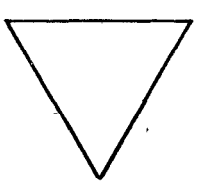
Example

Toughened safety glass obscured of nominal size 300 mm and thickness 15 mm shall be designated as:

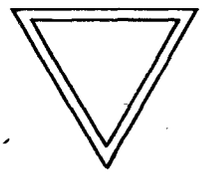
Toughened Safety Glass Obscured 300 × 15 IS 6180.

11 MARKING

11.1 Clear toughened glasses tested according to this standard shall be marked by an inverting equilateral triangle as shown below:

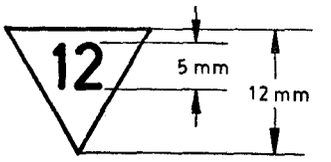


11.1.1 Obscured and other translucent glasses shall be marked, after the obscuring process and before the toughening procedure, by a double inverted equilateral triangle as shown below:

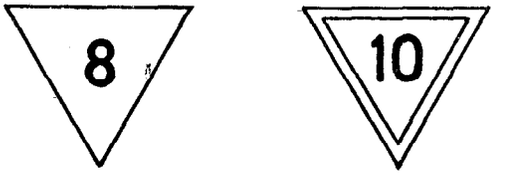


11.1.2 The nominal thickness of the toughened safety glass may be inserted within the triangle(s).

11.1.3 Minimum dimensions of (inner) triangle and the numerals, shall be as shown below:



EXAMPLE:



Clear Plate Glass — Obsecured Plate Glass

11.1.4 Toughened safety glass may be marked with the Standard Mark.

ANNEX A

(*Clauses* 9.1 *and* 9.2)

APPARATUS FOR PROOF LOAD TEST OF TOUGHENED SAFETY GLASSES FOR SHIPS' ROUND WINDOWS

A-1 TEST APPARATUS

A-1.1 The base of the test equipment is a plane surfaced steel plate having a 200 mm diameter centre hole with edges being rounded to a radius of 0·5 mm approximately and a flat rubber ring of hardness 40 to 60 IRHD with a thickness of 2 mm and a width of at least 15 mm, shall be placed on top of the steel plate in order to compensate for slight irregularities and to prevent the edges of the steel plate from affecting the glass in any way, the internal diameter of the ring being flush with the 200 mm diameter hole in the steel plate. The glass under test shall be placed on top of the hole of the rubber ring and a punch placed centrally on top of the glass. The punch shall have a diameter of 50 mm, with a hemispherical end, the lower part of it being flattened so that a plane surface with a diameter of 12·5 mm is obtained. A felt pad about 5 mm thick or a piece of fibreboard about 2 mm thick with a diameter of about 50 mm shall be interposed between the punch and the glass to compensate for any irregularities as shown in Fig. 2.

A-1.2 When testing glasses with a nominal diameter of 200 mm (effective diameter 213 to 215 mm respectively), an adaptor should be used having hole of 150 mm diameter with rounded edges with 0·5 mm radius. This adaptor shall be placed in the proof hole of 200 mm. A rubber ring of hardness 40 to 60 IRHD with a thickness of 2 mm and a width of at least 15 mm, the internal diameter of which is flush with the internal diameter of the adaptor, shall be placed on the adaptor.

A-2 PROCEDURE

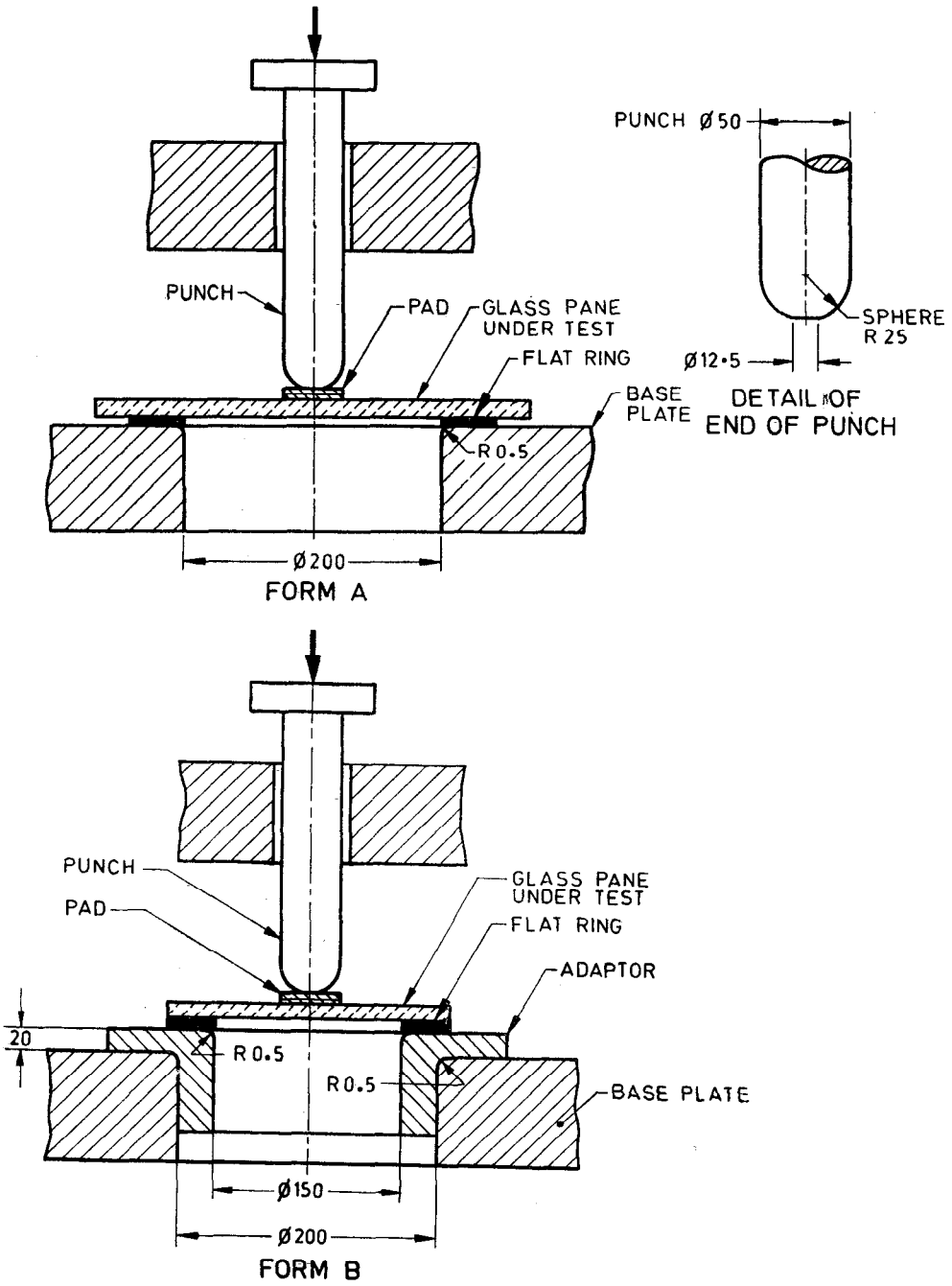
A-2.1 Place the glass on top of the flat ring, with obscured surface upwards in the case of obscured glass, so that no edge of the glass is less than 25 mm from the edge of the hole.

A-2.2 Lower the punch on to the fibre pad placed on top of the glass.

A-2.3 Apply a load to the punch, increasing steadily, at a rate of 1 000 N per second, until the appropriate proof load given in Table 6 is reached.

A-2.4 Maintain the specified load for 5 seconds and then gradually remove the load.

A-2.5 The glass shall remain unbroken and shall show no sign of damage.



All dimensions in millimetres.

FIG. 2 TEST APPARATUS

Table 6 Proof Load

(*Clause* A-2.3)

Glass Thickness		Proof Load for Diameter of Hole of Test Apparatus	
Nominal mm	Tolerance for Plate Glass mm	200 mm N	150 mm N
6	± 0·2	3 400	3 500
8	± 0·3	6 500	6 700
10	± 0·3	10 200	11 000
12	± 0·3	15 500	—
15	± 0·5	24 000	—
19	± 1·0	33 400	—

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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